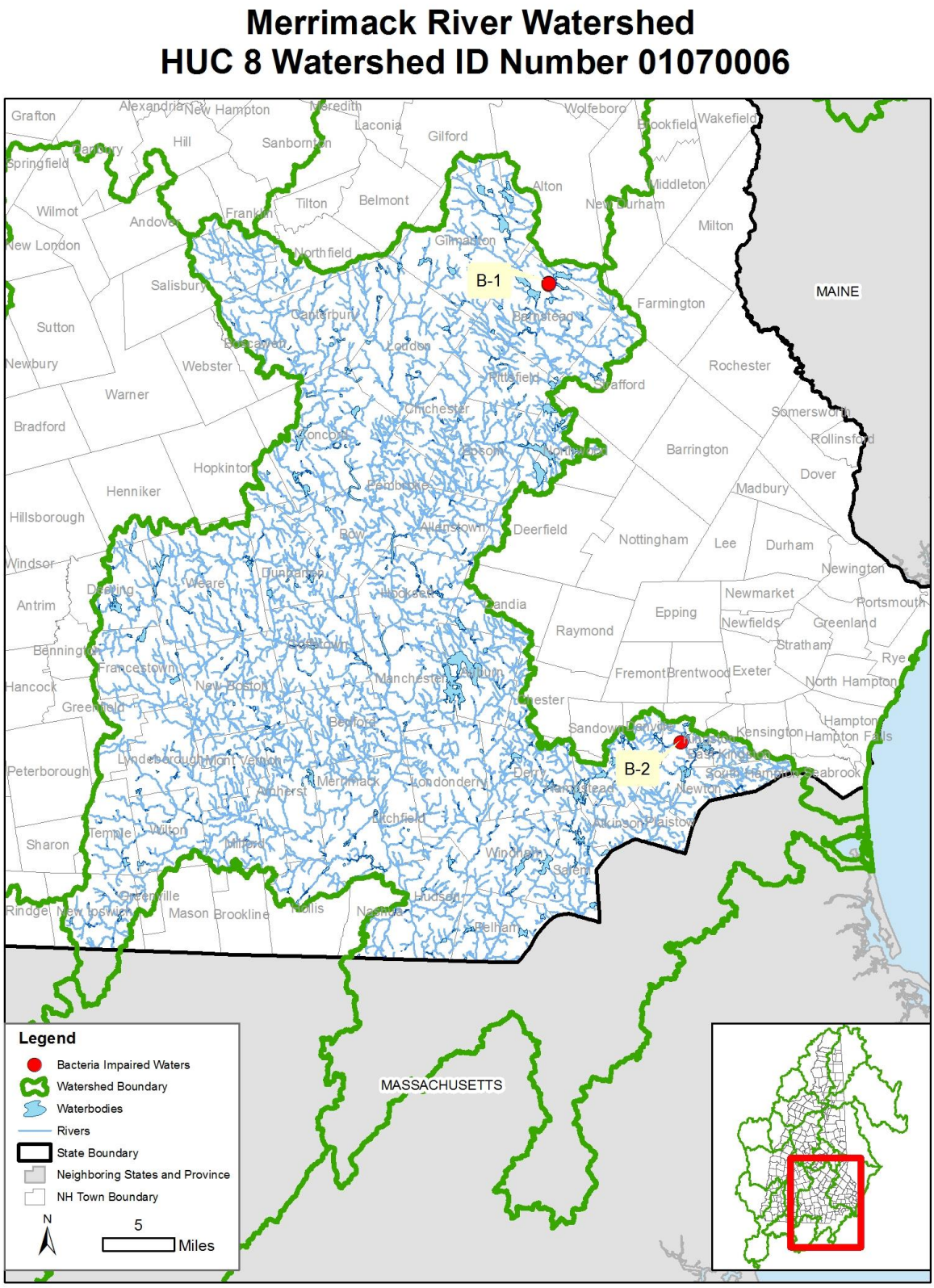
APPENDIX B
MERRIMACK RIVER WATERSHED
(HUC8: 01070006)

I. WATERSHED DESCRIPTION AND MAPS
The Merrimack River Watershed covers an area of approximately 1,671 square miles in the southeast section of New Hampshire. A very small percentage of the watershed, including a coastal section, is located in Massachusetts. There are 71 towns located at least partially within the watershed, extending from the Massachusetts border to the northern-most town of Gilford; west to east the town boundaries are Greenfield and South Hampton, respectively. The primary watercourse in the region is the Merrimack River which is the outflow from the Franklin Falls Dam in Franklin. North of the dam the watercourse is the Pemigewasset River. Notable lakes in the area are Everett Lake, Suncook Lake, and Massabesic Lake. Much of the Merrimack River Watershed is rolling hills and urban areas with a few mountain ranges such as the Blue Hills Range on the eastern border, the Belknap Mountains to the north, and the Wapack Range along the southwest border. There is a US Military Reservation on the town intersection of New Boston, Amherst, and Mont Vernon.

Based on the 2014 303(d) list, two assessment units (AUs) in this watershed are listed as being impaired for bacteria; these are Colony Beach on Locke Lake in Barnstead (section B1 of this appendix) and Park Association Beach on Great Pond in Kingston (section B2). TMDLs have been developed for the impaired AUs and their locations are shown on Figure 1 as red circles. For each impaired AU, information is provided regarding the bacteria data used to list the AU on the 2014 303(d) list and the percent reduction needed to meet each water quality criterion (and TMDL) based on the highest recorded bacteria measurement that exceeds the criterion for the AU. Recommended restoration measures are also provided for each impaired AU.

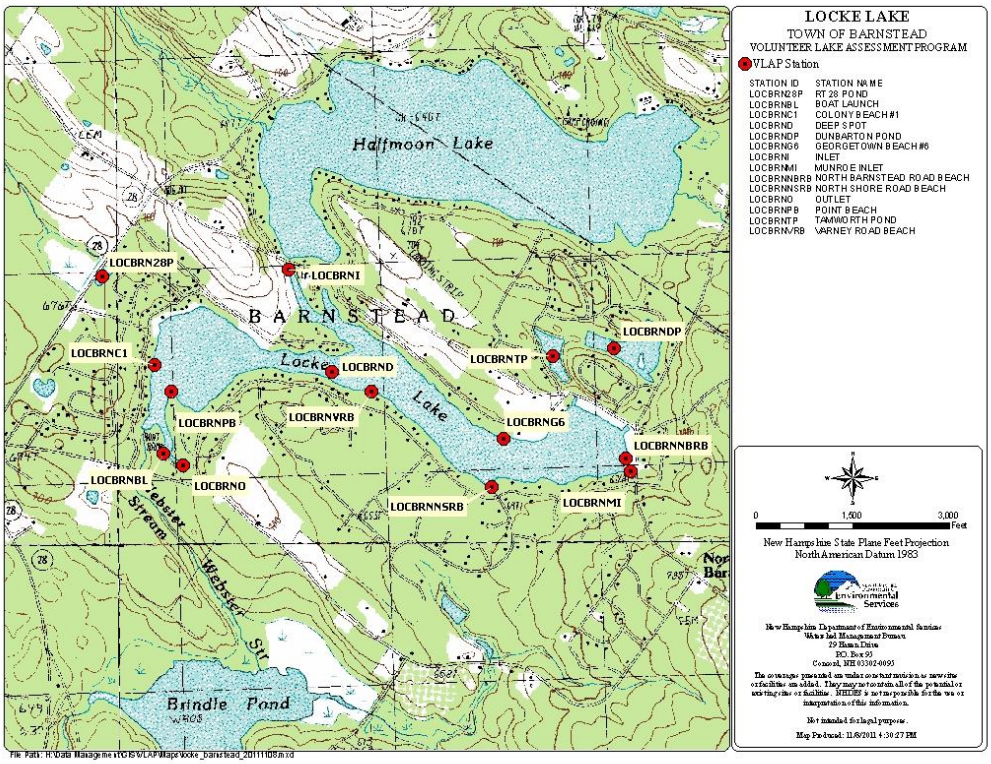
Figure 1: Merrimack River Watershed



B1: Colony Beach, Locke Lake, Barnstead, NH

Figure 2: Photo of Colony Beach, located on the west end of Locke Lake

Figure 3: Map of Colony Beach sample site LOCBRNC1(west end of the lake)



AUID: NHIMP700060402-02-05
Characteristics: freshwater, class B designation, primary contact recreation.
Impairment: *E coli*

<u>Water Quality Criteria & TMDL for E coli</u>
Single sample: 88 CTS/100mL
Geometric mean: 47 CTS/100mL

***Percent reduction for the Single Sample to meet the TMDL:* 78%**
***Percent reduction for the Geometric Mean to meet the TMDL:* 42%**

Data: NHDES EMD, 2014 303(d) list

Single sample *E coli* results (CTS/100ML) **Water Quality Criteria** = 88 CTS/100mL

Station Name	Station ID	Date	Result
Colony Beach, Locke Lake	LOCBRNC1	6/27/08	6.0
Colony Beach, Locke Lake	LOCBRNC1	8/3/08	120.0
Colony Beach, Locke Lake	LOCBRNC1	9/4/08	66.0
Colony Beach, Locke Lake	LOCBRNC1	7/7/09	3.0
Colony Beach, Locke Lake	LOCBRNC1	7/1/10	70.0
Colony Beach, Locke Lake	LOCBRNC1	8/18/10	270.0
Colony Beach, Locke Lake	LOCBRNC1	8/31/10	400.0
Colony Beach, Locke Lake	LOCBRNCL	6/13/11	8.0
Colony Beach, Locke Lake	LOCBRNCL	7/22/11	6.0
Colony Beach, Locke Lake	LOCBRNCL	8/18/11	40.0
Colony Beach, Locke Lake	LOCBRNCR	9/19/11	38.0
Colony Beach, Locke Lake	LOCBRNCL	6/14/12	6.0
Colony Beach, Locke Lake	LOCBRNCL	7/3/12	1.0
Colony Beach, Locke Lake	LOCBRNCL	8/29/12	20.0
Colony Beach, Locke Lake	LOCBRNCL	7/3/13	130.0
Colony Beach, Locke Lake	LOCBRNCL	7/5/13	10.0
Colony Beach, Locke Lake	LOCBRNCL	7/8/13	6.0
Colony Beach, Locke Lake	LOCBRNCL	7/26/13	150.0
Colony Beach, Locke Lake	LOCBRNCL	7/29/13	140.0
Colony Beach, Locke Lake	LOCBRNCL	8/9/13	48.0
Colony Beach, Locke Lake	LOCBRNCL	9/19/11	18.0
Colony Beach, Locke Lake	LOCBRNCR	6/13/11	10.0
Colony Beach, Locke Lake	LOCBRNCR	7/22/11	2.0
Colony Beach, Locke Lake	LOCBRNCR	8/18/11	28.0
Colony Beach, Locke Lake	LOCBRNCR	6/14/12	20.0
Colony Beach, Locke Lake	LOCBRNCR	7/3/12	1.0
Colony Beach, Locke Lake	LOCBRNCR	8/29/12	8.0
Colony Beach, Locke Lake	LOCBRNCR	7/3/13	94.0
Colony Beach, Locke Lake	LOCBRNCR	7/5/13	170.0
Colony Beach, Locke Lake	LOCBRNCR	7/8/13	20.0
Colony Beach, Locke Lake	LOCBRNCR	7/26/13	400.0
Colony Beach, Locke Lake	LOCBRNCR	7/29/13	86.0
Colony Beach, Locke Lake	LOCBRNCR	8/9/13	8.0

Shaded cells indicate exceedance of water quality criteria. Method detection limits are 2.0 – 400.0 cts/100mL. Results below 2.0 are listed as1.0 (½ the detection limit) and any counts greater than 400 are listed as 400.

Geometric mean *E. coli* results (CTS/100ML) **Water Quality Criteria** = 47 CTS/100mL

Station Name	Full Comparison Description	Date	Result
Colony Beach, Locke Lake	E.COLI-GEO-CP	7/22/11	5.6
Colony Beach, Locke Lake	E.COLI-GEO-CP	8/18/11	10.8
Colony Beach, Locke Lake	E.COLI-GEO-CP	7/3/12	3.3
Colony Beach, Locke Lake	E.COLI-GEO-CP	8/29/12	3.6
Colony Beach, Locke Lake	E.COLI-GEO-CP	8/9/13	54.5
Colony Beach, Locke Lake	E.COLI-GEO-NCP	9/16/11	14.5
Colony Beach, Locke Lake	E.COLI-GEO30-CP	8/18/11	10.8
Colony Beach, Locke Lake	E.COLI-GEO30-CP	7/3/12	3.3
Colony Beach, Locke Lake	E.COLI-GEO30-CP	7/29/13	66.9
Colony Beach, Locke Lake	E.COLI-GEO30-CP	8/9/13	80.8

Shaded cells indicate exceedance of water quality criteria.

Recommended Restoration Measures

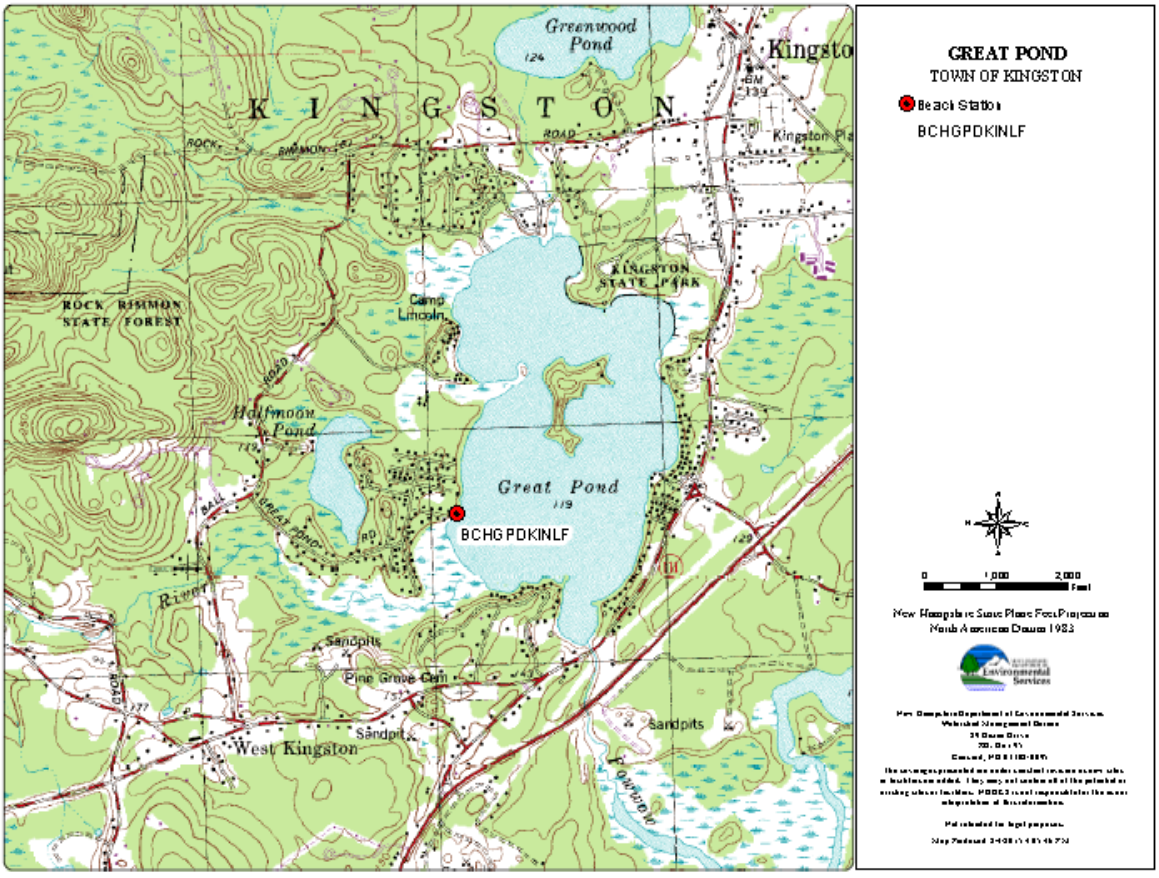
Bacterial contamination of surface waters may result from a variety of sources including human waste, excrement from barnyard animals, pet feces, and agricultural applications of manure and wildlife, including large congregations of birds and small mammals. Based on visual reconnaissance conducted by DES in 2015, recommended actions to reduce bacteria levels at Colony Beach (which have been successfully employed at other New Hampshire beaches) include measures to deter geese (such as installation of trumpeter swan and coyote decoys – see the DES Fact sheet[1]), collection of scat from the beach and wading areas and posting signs to deter feeding wildlife. Following implementation, monitoring for *E. coli* should continue to determine if the restoration measures are sufficient to meet water quality standards or if additional restoration activities are necessary.

[1] The NH DES Fact Sheet titled " Canada Geese Facts and Management Options is available at http://des.nh.gov/organization/commissioner/pip/factsheets/bb/documents/bb-53.pdf

B2: Park Association Beach, Great Pond, Kingston, NH

Figure 4: Park Association Beach Photo

Figure 5: Map of Park Association Beach Sample Site Location on Great Pond



AUID NHLAK700061403-06-05
Characteristics: freshwater, class B designation, primary contact recreation.
Impairment: *E coli*

<u>Water Quality Criteria & TMDL for E coli</u>
Single sample: 88 CTS/100Ml
Geometric mean: 47 CTS/100mL

Percent reduction for Single Sample to meet the TMDL: 70%
Percent reduction for Geometric Mean to meet the TMDL: 67%

Data: NHDES EMD, 2014 303(d) list

Single sample *E coli* results (CTS/100ML) Water Quality Criteria = 88 CTS/100mL

Station Name	Station ID	Date	Result
Park Association Beach, Great Pond	BCHGPDKINLF	6/30/10	140.0
Park Association Beach, Great Pond	BCHGPDKINLF	7/2/10	7.0
Park Association Beach, Great Pond	BCHGPDKINLF	7/28/10	4.0
Park Association Beach, Great Pond	BCHGPDKINLF	7/25/11	2.0
Park Association Beach, Great Pond	BCHGPDKINLF	6/25/12	4.0
Park Association Beach, Great Pond	BCHGPDKINLF	7/23/12	2.0
Park Association Beach, Great Pond	BCHGPDKINLF	8/17/12	1.0
Park Association Beach, Great Pond	BCHGPDKINLF	6/4/13	290.0
Park Association Beach, Great Pond	BCHGPDKINLF	6/6/13	120.0
Park Association Beach, Great Pond	BCHGPDKINLF	6/10/13	86.0
Park Association Beach, Great Pond	BCHGPDKINLF	7/15/13	42.0
Park Association Beach, Great Pond	BCHGPDKINLF	8/15/13	8.0
Park Association Beach, Great Pond	BCHGPDKINLF	5/21/12	6.0

Shaded cells indicate exceedance of water quality criteria. Method detection limits are 2.0 – 400.0 cts/100mL. Results below 2.0 are listed as1.0 (½ the detection limit) and any counts greater than 400 are listed as 400.

Geometric mean *E. coli* results (CTS/100ML) Water Quality Criteria = 47 CTS/100mL

Station Name	Full Comparison Description	Date	Result
Park Association Beach, Great Pond	E.COLI-GEO-CP	7/28/10	15.8
Park Association Beach, Great Pond	E.COLI-GEO-CP	8/17/12	2.0
Park Association Beach, Great Pond	E.COLI-GEO-CP	7/15/13	105.9
Park Association Beach, Great Pond	E.COLI-GEO30-CP	7/28/10	15.8
Park Association Beach, Great Pond	E.COLI-GEO30-CP	6/10/13	144.1

Shaded cells indicate exceedance of water quality criteria

Recommended Restoration Measures

On May 21st 2015, staff from the DES TMDL Program and the Beach Monitoring Program met on site with the Great Pond Park Beach (also known as 5th Street Beach) Association Members and Landowners Richard Coleman and Bob Sullivan. Mr. Coleman is also the Volunteer Lake Assessment Program (VLAP) monitor at the beach. We discussed the development of the TMDL Report, reviewed the sampling data from the beach swimming area used to develop the TMDL report and discussed information on what/where the potential source(s) of bacteria might be in that area. There were no stormwater/road runoff areas apparent, no history or evidence of failing septic systems in the area (the lake association provides a restroom facility at the beach area during the

summer) and there is no history of issues with pet waste in the beach area. There is, however, an area of lawn directly adjacent to the beach with a large marsh/wetland area beyond the footprint of lawn. Waterfowl (geese) however, have been seen on the lawn and in and around the roped off swimming area for the beach. Information on deterring the presence of waterfowl such as swan decoys and planting brush along the shoreline, was discussed with the landowners. These and other geese deterrent measures are described in the DES Fact Sheet[2]. Implementation of measures such as these have proven successful at other beaches in New Hampshire and it is recommended that similar waterfowl deterrent measures be implemented at Great Pond Beach as a first step. Following implementation, monitoring for *E. coli* should continue to determine if the restoration measures are sufficient to meet water quality standards or if additional restoration activities are necessary.

[2] The NH DES Fact Sheet titled " Canada Geese Facts and Management Options is available at http://des.nh.gov/organization/commissioner/pip/factsheets/bb/documents/bb-53.pdf